

WHAT IS CLAIMED IS:

1. An image processing apparatus for executing a smoothing process of image data, comprising:
 - extraction means for extracting a pixel of interest and surrounding pixels thereof from input image data;
 - first average value calculation means for calculating an average value of the pixels extracted by said extraction means;
 - separation means for separating the pixels extracted by said extraction means into two categories using the average value calculated by said first average value calculation means;
 - second average value calculation means for calculating average pixel values of the two categories; and
 - output means for outputting a value, which is approximate to a pixel value of the pixel of interest, of the average pixel values of the two categories
- 20 calculated by said second average value calculation means.
2. An image processing apparatus for executing a smoothing process of image data, comprising:
 - extraction means for extracting a pixel of interest and surrounding pixels thereof from input image data;

first average value calculation means for calculating an average value of the pixels extracted by said extraction means;

separation means for separating the pixels
5 extracted by said extraction means into two categories using the average value calculated by said first average value calculation means;

second average value calculation means for calculating average pixel values of the two categories;

10 determination means for determining whether or not the pixel of interest belongs to a flat region; and output means for, when said determination means determines that the pixel of interest belongs to a flat region, outputting the average value calculated by said
15 first average value calculation means as smoothed data, and for, when said determination means determines that the pixel of interest does not belong to a flat region, outputting a value, which is approximate to a pixel value of the pixel of interest, of the average pixel
20 values of the two categories calculated by said second average value calculation means.

3. An image processing apparatus for executing a smoothing process of image data, comprising:

image reduction means for reducing an input
25 image;

extraction means for extracting a pixel of interest and surrounding pixels thereof from the image reduced by said image reduction means;

first average value calculation means for
5 calculating an average value of the pixels extracted by said extraction means;

separation means for separating the pixels extracted by said extraction means into two categories using the average value calculated by said first
10 average value calculation means;

second average value calculation means for calculating average pixel values of the two categories; and

output means for outputting a value, which is
15 approximate to a pixel value of the pixel of interest, of the average pixel values of the two categories calculated by said second average value calculation means.

4. An image processing apparatus for executing a
20 smoothing process of image data, comprising:

image reduction means for reducing an input image;

extraction means for extracting a pixel of interest and surrounding pixels thereof from the image
25 reduced by said image reduction means;

first average value calculation means for calculating an average value of the pixels extracted by said extraction means;

separation means for separating the pixels
5 extracted by said extraction means into two categories using the average value calculated by said first average value calculation means;

second average value calculation means for calculating average pixel values of the two categories;

10 determination means for determining whether or not the pixel of interest belongs to a flat region; and output means for, when said determination means determines that the pixel of interest belongs to a flat region, outputting the average value calculated by said
15 first average value calculation means as smoothed data, and for, when said determination means determines that the pixel of interest does not belong to a flat region, outputting a value, which is approximate to a pixel value of the pixel of interest, of the average pixel
20 values of the two categories calculated by said second average value calculation means.

5. The apparatus according to claim 1, further comprising:

selection means for selecting one of the value
25 output by said output means and the pixel value of the pixel of interest in accordance with a difference value

between the value output by said output means and the pixel value of the pixel of interest.

6. An image processing method for executing a smoothing process of image data, comprising the steps 5 of:

(a) extracting a pixel of interest and surrounding pixels thereof from input image data;

(b) calculating an average value of the pixels extracted in the step (a);

10 (c) separating the pixels extracted in the step (a) into two categories using the average value calculated in the step (b);

(d) calculating average pixel values of the two categories; and

15 (e) outputting a value, which is approximate to a pixel value of the pixel of interest, of the average pixel values of the two categories calculated in the step (d).

7. An image processing method for executing a 20 smoothing process of image data, comprising the steps of:

(a) extracting a pixel of interest and surrounding pixels thereof from input image data;

25 (b) calculating an average value of the pixels extracted in the step (a);

- (c) separating the pixels extracted in the step (a) into two categories using the average value calculated in the step (b);
- (d) calculating average pixel values of the two categories;
- (e) determining whether or not the pixel of interest belongs to a flat region; and
- (f) outputting, when it is determined in the step (e) that the pixel of interest belongs to a flat region, the average value calculated in the step (b) as smoothed data, and outputting, when it is determined in the step (e) that the pixel of interest does not belong to a flat region, a value, which is approximate to a pixel value of the pixel of interest, of the average pixel values of the two categories calculated in the step (d).

8. An image processing method for executing a smoothing process of image data, comprising the steps of:

- 20 (a) reducing an input image;
- (b) extracting a pixel of interest and surrounding pixels thereof from the image reduced in the step (a);
- (c) calculating an average value of the pixels extracted in the step (b);

- (d) separating the pixels extracted in the step
- (b) into two categories using the average value calculated in the step (c);
- (e) calculating average pixel values of the two categories; and
- (f) outputting a value, which is approximate to a pixel value of the pixel of interest, of the average pixel values of the two categories calculated in the step (e).

10 9. An image processing method for executing a smoothing process of image data, comprising:

- (a) reducing an input image;
- (b) extracting a pixel of interest and surrounding pixels thereof from the image reduced in
- 15 the step (a);
- (c) calculating an average value of the pixels extracted in the step (b);
- (d) separating the pixels extracted in the step
- (b) into two categories using the average value
- 20 calculated in the step (c);
- (e) calculating average pixel values of the two categories;
- (f) determining whether or not the pixel of interest belongs to a flat region; and
- 25 (g) outputting, when it is determined in the step (f) that the pixel of interest belongs to a flat region, the average value calculated in the step (c) as

smoothed data, and outputting, when it is determined in
the step (f) that the pixel of interest does not belong
to a flat region, a value, which is approximate to a
pixel value of the pixel of interest, of the average
5 pixel values of the two categories calculated in the
step (e).

10. The method according to claim 6, further
comprising the step of:

(f) selecting one of the value output in the
10 step (e) and the pixel value of the pixel of interest
in accordance with a difference value between the value
output in the step (e) and the pixel value of the pixel
of interest.

11. Computer executable program code for executing a
15 smoothing process of image data, the code comprising:

an extraction step of extracting a pixel of
interest and surrounding pixels thereof from input
image data;

a first average value calculation step of
20 calculating an average value of the pixels extracted in
the extraction step;

a separation step of separating the pixels
extracted in the extraction step into two categories
using the average value calculated in the first average
25 value calculation step;

a second average value calculation step of calculating average pixel values of the two categories; and

an output step of outputting a value, which is
5 approximate to a pixel value of the pixel of interest, of the average pixel values of the two categories calculated in the second average value calculation step.

12. A computer-readable medium having computer-executable program code for executing a
10 smoothing process of image data, the code comprising:

an extraction step of extracting a pixel of interest and surrounding pixels thereof from input image data;

a first average value calculation step of
15 calculating an average value of the pixels extracted in the extraction step;

a separation step of separating the pixels extracted in the extraction step into two categories using the average value calculated in the first average
20 value calculation step;

a second average value calculation step of calculating average pixel values of the two categories; and

an output step of outputting a value, which is
25 approximate to a pixel value of the pixel of interest, of the average pixel values of the two categories calculated in the second average value calculation step.